

THREE NEW SPECIES OF HARPACTICOIDA (CRUSTACEA, COPEPODA) FROM SANDY BEACHES IN ALGOA BAY, SOUTH AFRICA, WITH KEYS TO THE GENERA *ARENOSSETELLA*, *HASTIGERELLA*, *LEPTASTACUS* AND *PSAMMASTACUS*

By

ANTON MCLACHLAN

Department of Marine Biology, University of Liverpool, Port Erin, Isle of Man, and Zoology Department, University of Port Elizabeth, South Africa

&

COLIN G. MOORE

Department of Marine Biology, University of Liverpool, Port Erin, Isle of Man

(With 7 figures)

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ABSTRACT

A new species of harpacticoid copepod of the family Ectinosomatidae, *Arenosetella fimbriaticauda* sp. nov., is described from Algoa Bay, South Africa. It appears related to *A. duriensis* Galhano and *A. littoralis* Bodin from which it differs in the setation of the endopodites of the walking legs. It is proposed that *Hastigerella palpilabra* Nicholls and *A. monensis* Moore are synonymous with *H. tenuissima* (Klie) which is transferred to the genus *Arenosetella*. Two new species of the family Cyliindropsyllidae are also described. *Leptastacus naylori* sp. nov. differs from all described species of *Leptastacus* in the setation of the walking legs, while *Psammastacus erasmusi* sp. nov. appears closely related to *P. ghanai* (Chappuis & Rouch) from which it differs in the setation of the fourth leg and the structure of the fifth leg and furcal rami. Keys to all these genera are provided.

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PART 1

INTRODUCTION

During investigations of the meiofauna of sandy beaches in Algoa Bay, South Africa, specimens were collected of an interstitial harpacticoid of the family Ectinosomatidae Sars, 1903, genus *Arenosetella* Wilson, 1932, thought to be new to science. This species, referred to as *Hastigerella* sp. A by McLachlan & Furstenberg (1977), is abundant around the high tide level on King's Beach and has also been recorded on Sunday's River Beach, Algoa Bay. The physical characteristics of these exposed sandy beaches have been described by McLachlan (1977).

SYSTEMATIC DESCRIPTION

Family Ectinosomatidae Sars

Arenosetella fimbriaticauda sp. nov.

Material

A number of specimens were extracted from fine sand collected at the spring high tide level on King's Beach (25°39'E 33°57'S) and preserved in 5 per cent buffered formalin. For examination adult male and female specimens were dissected in lactic acid and mounted in polyvinyl lactophenol.

Holotype

1 dissected ♀ (SAM-A15708) deposited with the South African Museum Cape Town, South Africa.

Allotype

1 adult ♂ (SAM-A15712) in the South African Museum.

Paratypes

2 ♂♂ (SAM-A15710 and 15711) and 1 ♀ (SAM-A15709) in the South African Museum.

Other specimens are in the first author's collection.

Description of adult female

Length 0,30–0,32 mm from base of rostrum to base of furcae. Body (cf Fig. 1A) vermiform, cylindrical, with subtriangular pointed rostrum. Cephalothoracic shield rectangular in dorsal view, with striations and bearing fine hairs anteriorly. Cephalothorax about half as long as four free thoracic somites combined; cephalothorax and thorax together slightly longer than abdomen. Hyaline frill striated; cephalothorax and first two free thoracic somites fully-incised obtusidigitate becoming acutidigitate (Moore 1976a) posteriorly; penultimate somite (Fig. 1C–D) semi-incised subulate with small pseudopericulum dorsally and similar lobe ventrally; remaining somites deeply-incised subulate (Fig. 1B). Cuticle of anal somite drawn out into rows of weak spinuli-

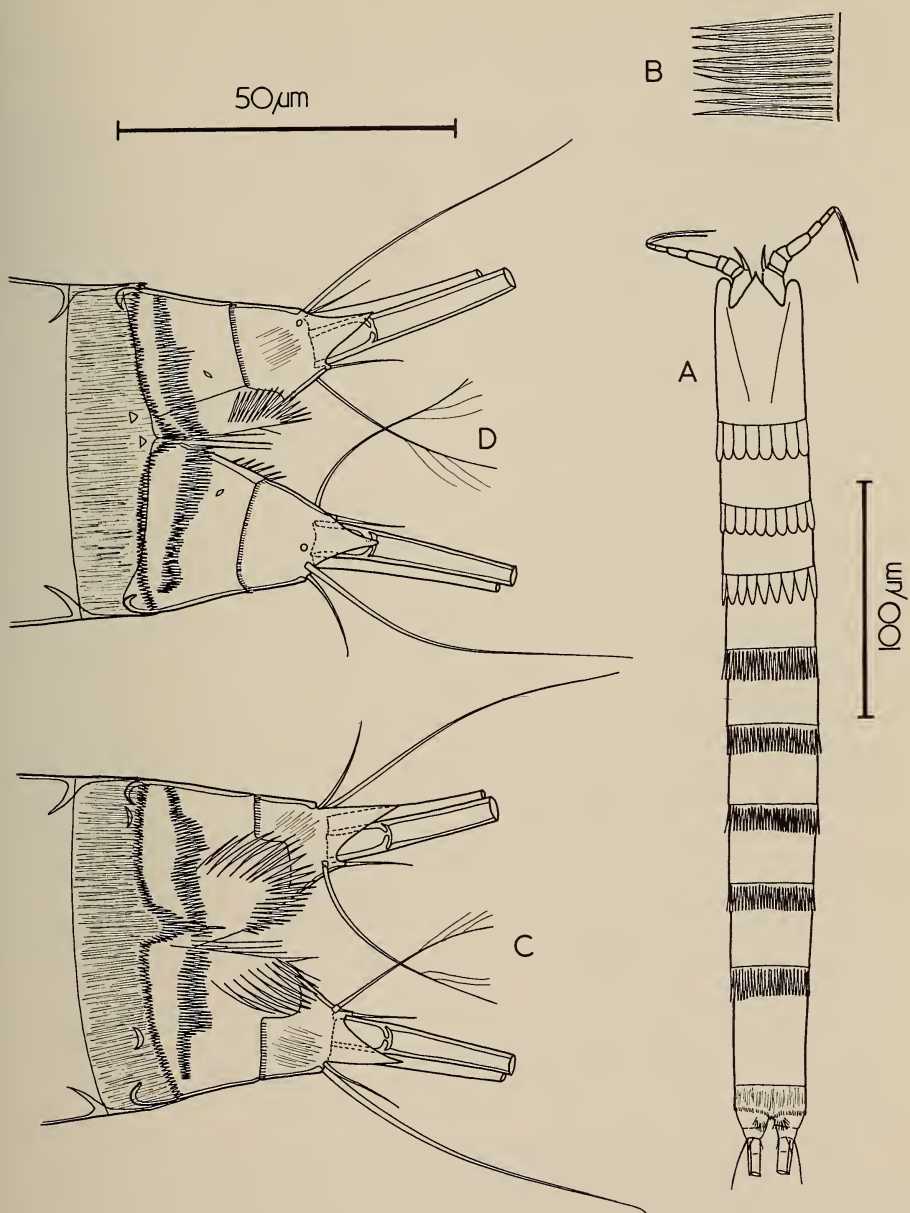


Fig. 1. *Arenosetella fimbriatocauda* sp. nov.

A. ♂ dorsal. B. ♀ abdominal hyaline frill. C. ♀ furcae dorsal. D. ♀ furcae ventral.

form lappets; anterior row present dorsally and ventrally and apparently continuous inside median somitic cleft; posterior row of larger lappets curving from the inner surface of the cleft onto the dorsal surface. Posterior margin of anal somite with row of minute spinules. Genital double somite without obvious signs of subdivision.

Furcal ramus (Fig. 1C-D). Striated, slightly wider than long and tapering distally (the specimen from which the drawings were made was slightly flattened). Two principal terminal setae, inner one about as long as abdomen and free thoracic somites combined and twice as long as outer one; accompanied to the outside by one long and one short fine seta and to the inside by one short and one longer, distally-plumose, fine seta. Distal margin of furca drawn out into one dorsal and one ventral triangular lappet.

Antennule (Fig. 2A). Five-segmented, but segment five may possibly be composed of a short proximal and a longer distal component. First segment with a large plumose seta at anterior distal corner and a transverse row of fine spinules on anterior surface. Third and terminal segments each supplied with one aesthetasc.

Antenna (Fig. 2B). Exopodite three-segmented; first segment bearing one terminal seta; second segment shortest and with one terminal seta; distal segment with two terminal setae and a transverse row of spinules. Endopodite two-segmented; first segment longer and slightly curved; second segment with two transverse rows of spinules, anterior margin with some spinules near proximal corner and two juxtaposed, spinulose setae; distal margin with six spinulose spiniform setae.

Mandible (Fig. 2C). Coxa-basis with three setae near anterior distal corner. Exopodite furnished with one lateral and two terminal setae. Endopodite same length as coxa-basis and armed with three outer, three distal and two inner setae.

Maxillula (Fig. 2D). Arthrite of praecosa armed with one slender and four strong unguiform spines. Basis with four setae, endopodite with four setae, exopodite with two setae.

Maxilla (Fig. 2E). Syncoxa with two endites, each with two setae. Basis with three setae near proximal inner edge. Endopodite with two strong geniculate setae and four slender setae.

Maxillipede (Fig. 2F). First endopodite segment longer than second and with a row of long hairs along inner edge. Second segment with two fine setae on inner edge, the proximal one longer, and two fine apical setae of different lengths.

Leg 1 (Fig. 3A). Coxa and basis each with outer distal spinule row and basis with strong inner seta. Rami three-segmented, spinulose along outer edges. Exopodite extending to middle of distal endopodite segment; second segment with inner seta modified with branched tip. Endopodite with median and distal transverse rows of spinules on first segment and short distal row on second segment.

Legs 2-4 (Fig. 3B-D). Coxa and basis each with outer distal spinule row.

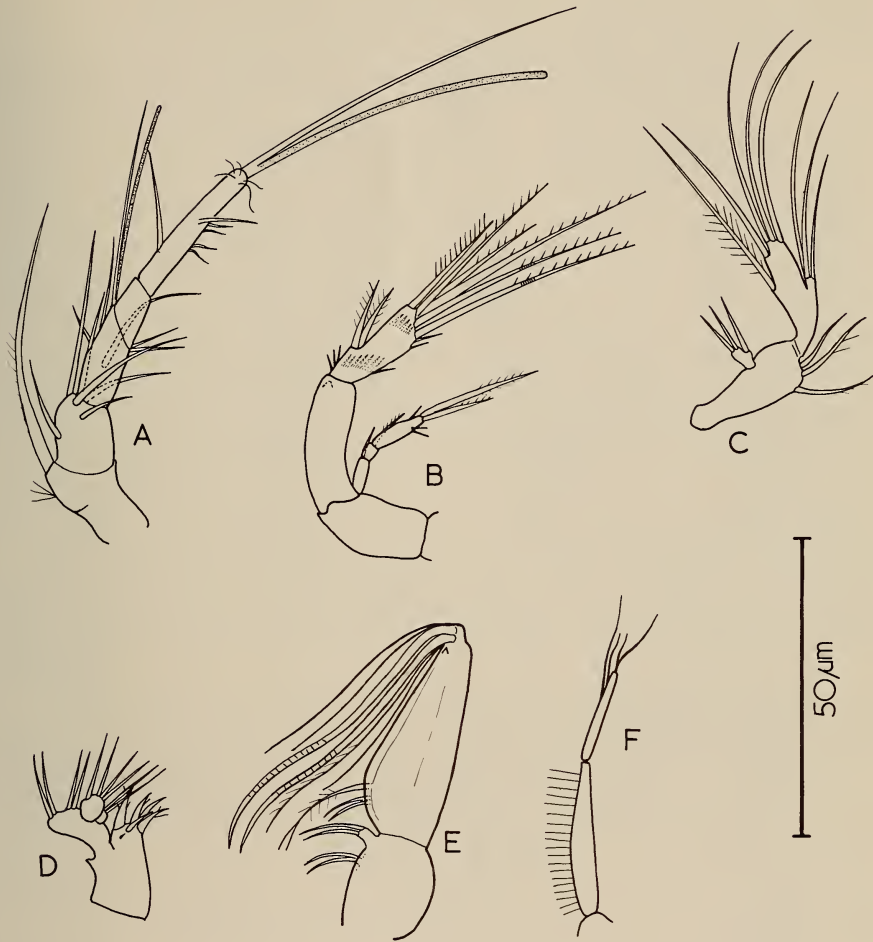


Fig. 2. *Arenosetella fimbriata* sp. nov. ♀

A. Antennule. B. Antenna. C. Mandible. D. Maxillula. E. Maxilla. F. Maxillipede.

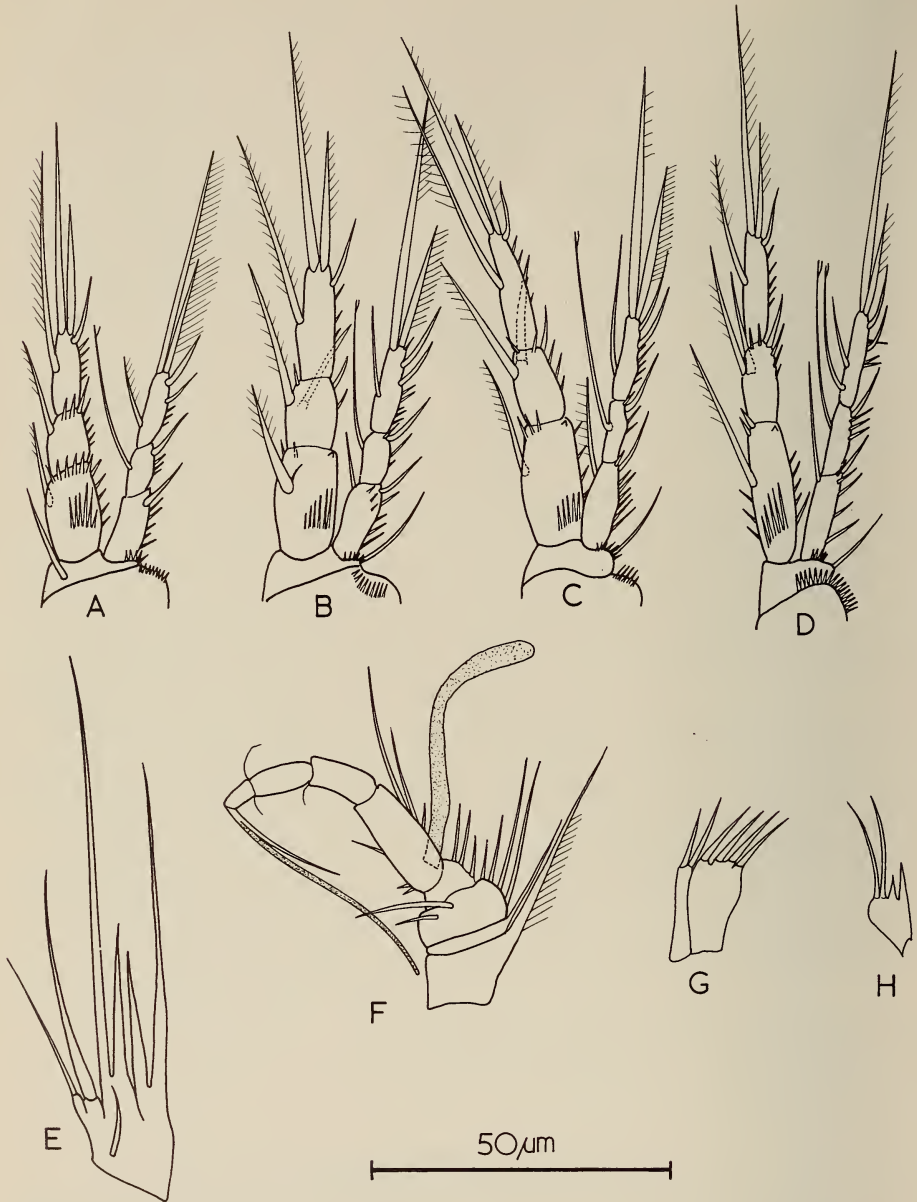


Fig. 3. *Arenosetella fimbriaticauda* sp. nov.

A. ♀ P1. B. ♀ P2. C. ♀ P3. D. ♀ P4. E. ♀ P5. F. ♂ antennule. G. ♂ P5. H. ♂ P6.

Rami three-segmented, more or less spinulose along outer margins. Exopodite extending past second endopodite segment; middle segment with modified inner seta, such a seta also being present on the inner margin of the distal segment of the P4. Endopodite with transverse row of spinules on first segment; second segment bears, in addition to the inner seta, a short, thick, weakly-chitinized seta on the posterior surface just inside the inner margin.

The setal formula is:

	Exopodite					Endopodite				
	1	2	3			1	2	3		
P1	0	1	1	2	2	1	1	1	2	1
P2	1	1	1	2	2	1	2	1	2	1
P3	1	1	1	2	2	1	2	1	2	1
P4	1	1	2	2	2	1	2	1	2	1

Leg 5 (Fig. 3E). Rami indistinctly defined. Accessory seta issuing near base of limb. Exopodite with three marginal setae; outer seta issuing from small lobule, middle seta longest. Inner expansion of basoendopodite extending almost to end of exopodite; inner seta more than twice as long as outer seta.

Description of adult male

Length 0,32–0,34 mm. Agrees with female apart from the following features.

Antennule (Fig. 3F). Eight-segmented; first segment bearing stout plumose seta at anterior distal corner; second segment very short; fifth segment longest and furnished with a large aesthetasc; terminal segment with long, slender aesthetasc.

Leg 5 (Fig. 3G). The structure could not be definitively interpreted. All setae subequal. Inner part of basoendopodite apparently distinct, bearing two distal setae and extending to about the end of the exopodite. Exopodite with three marginal setae and no sign of an accessory seta.

Leg 6 (Fig. 3H). Bearing two inner spines and two outer setae.

Variability

Only slight variation in size was noted.

Etymology

The specific name alludes to the presence of the rows of fringing lappets on the anal somite.

DISCUSSION

Arenosetella fimbriaticauda shows affinities with *A. duriensis* (Galhano 1970) and *A. littoralis* (Bodin 1978) from which it differs by the setation of the distal endopodite segments of P2–P4. These three species, with their anal rows of spinules or lappets, and *A. balakrishnani* (Bozic 1966) with four dorsal pairs of spines on the anal somite, differ from most other members of the genus

which have claw-like structures. Lang (1965) distinguished *Arenosetella* from *Hastigerella* solely by the presence of these anal claws. Wells (1976), however, broadened the definition to include under *Arenosetella* forms with setae or spines (as well as claws) on the dorsal surface of the anal somite as opposed to the naked state in *Hastigerella*.

Whether all these anal structures are homologous is open to question, as is their derivation. Chappuis (1953) believed that the anal claws are homologous to the anal operculum present in most other harpacticoids. Thus, the last copepodite stage of *Arenosetella incerta* Chappuis, 1953, possesses an operculum armed with long spines, which in the adult are replaced by the claws. The ornamentation of *A. fimbriaticauda*, however, suggests an alternative origin: the position of the inner posterior row of lappets in *A. fimbriaticauda* is occupied by a row of hairs or spinules in many harpacticoid species in several families (e.g. *Pseudobradya pulchra* Lang, 1965; *Arenolaophonte stygia* Lang, 1965). *Arenosetella fimbriaticauda* may well represent an intermediate stage in the development of this row, which is further modified into the laminar spines of *A. kaiseri* Lang, 1965, and eventually into the unguiform claws of *A. germanica* Kunz, 1938, and several other species.

The anal ornamentation was examined in several species of *Hastigerella*, viz. *H. palpilabra* Nicholls, 1935, from the type locality (Millport, Scotland), *H. tenuissima* (Klie, 1929) and *H. leptoderma* (Klie, 1929) from the Island of Sylt, Germany. Careful examination, using phase contrast microscopy, failed to reveal any dorsal armature of the anal somite in *H. leptoderma*; however, both *H. palpilabra* and *H. tenuissima* were found to exhibit a pair of bifid appendages identical to those of *A. monensis* Moore, 1976b. These are markedly weaker than those found in *A. germanica* (see Moore 1976b) and are consequently easily overlooked. Further examination showed these three species to be identical, the apparent setational differences of the pereopods recorded in the literature being due to variance of interpretation. *A. incerta* sensu Bodin, 1971, also appears conspecific. The senior synonym, *H. tenuissima* must, therefore, be placed in the genus *Arenosetella* and it is suggested that *H. leptoderma* replaces *H. palpilabra* as the type-species of *Hastigerella*.

The following are a key to *Arenosetella* updated from Moore (1976b) and a key to *Hastigerella* based partly on the keys of Lang (1965), Apostolov (1974) and Wells (1976).

KEY TO ARENOSETELLA WILSON

1. Last somite dorsally with two simple appendages 2
- Last somite dorsally with two bifid appendages, each appendage furnished with an accessory spine 3
- Last somite dorsally with two trifid appendages spec. aff. *incerta* Noodt, 1958
- Last somite dorsally either with two bifid appendages without accessory spines or with two overlapping spines on each side of middle line 4
- Last somite dorsally with four pairs of spines *balakrishnani* Bozic, 1966
- Last somite with two rows of spinuliform lappets or spinules entirely or partly on the dorsal surface 8

2. Appendages not fused at base; last segment exopodite P4 with 2 inner setae
 — Appendages fused at base; last segment exopodite P4 without inner setae
spinicauda Wilson, 1932
indica Krishnaswamy, 1957
3. Accessory spine situated on outer side above bifurcation; last segment endopodite P4 with 4 setae and spines in all *fissilis* Wilson, 1932
 — Accessory spine situated on inner side on a level with bifurcation; last segment endopodite P4 with 3 setae and spines in all *incerta* Chappuis, 1953
4. Last segment endopodite P3 and P4 each with 5 setae and spines in all
madagascariensis Lang, 1965
 — Last segment endopodite P3 and P4 each with 4 setae and spines in all 5
 — Last segment endopodite P3 and P4 each with 3 setae and spines in all 7
5. Middle segment endopodite P4 with 1 seta *bidentata* Ito, 1972
 — Middle segment endopodite P4 with 2 setae 6
6. Appendages of last somite bifid, unguiform *germanica* Kunz, 1938
 — Appendages of last somite straight *kaiseri* Lang, 1965
7. First segment exopodite P2 and P3 each with 1 inner seta *rouchi* Lang, 1965
 — First segment exopodite P2 and P3 each with no inner seta. *tenuissima* (Klie, 1929)
8. Last segment endopodite P2-P4 with 4 setae and spines in all *fimbriaticauda* sp. nov.
 — Last segment endopodite P2-P4 with 5 setae and spines in all 9
9. Middle segment exopodite P2-P4 with 1 inner seta *duriensis* Galhano, 1970
 — Middle segment exopodite P2-P4 with 2 inner setae *littoralis* Bodin, 1978

KEY TO *HASTIGERELLA* NICHOLLS

1. Last segment exopodite P3 with 8 setae and spines in all *soyeri* Bodin, 1976
 — Last segment exopodite P3 with 7 setae and spines in all 2
 — Last segment exopodite P3 with 6 setae and spines in all 3
 — Last segment exopodite P3 with 5 setae and spines in all 7
2. Last segment exopodite P2-P4 with 7-7-7 setae and spines in all
meridionalis (Chappuis, 1954)
 — Last segment exopodite P2-P4 with 6-7-7 setae and spines in all *unisetosa* (Wells, 1965)
 — Last segment exopodite P2-P4 with 7-6-6 setae and spines in all *chappuisi* Soyer, 1974
3. Last segment endopodite P2-P4 with 4 setae and spines in all 4
 — Last segment endopodite P2-P4 with 5 setae and spines in all 5
 — Last segment endopodite P2-P4 with 6 setae and spines in all *scheibeli* Mielke, 1975
4. A1 with 6 segments; penultimate abdominal somite with posterior ventral spinule row *abbotti* Lang, 1965
 — A1 with 7 segments; penultimate abdominal somite with no posterior ventral spinule row *bozici* Soyer, 1974
5. Middle segment endopodite P2-P4 with 2 inner setae *noodti* (Rao & Ganapati, 1969)
 — Middle segment endopodite P2-P4 with 1 inner seta 6
6. Furca longer than broad *bodini* Apostolov, 1974
 — Furca broader than long *psammae* (Noodt, 1955)
7. Middle segment endopodite P1 with 2 inner setae 8
 — Middle segment endopodite P1 with 1 inner seta 9
8. Last segment endopodite P1-P4 with 3 setae and spines in all
clavata (Rao & Ganapati, 1969)
 — Last segment endopodite P1-P4 with 5 setae and spines in all *leptoderma* (Klie, 1929)
9. Last segment exopodite P1 with 6 setae and spines in all
monniotae (Guille & Soyer, 1966)
 — Last segment exopodite P1 with 5 setae and spines in all 10
 — Last segment exopodite P1 with 4 setae and spines in all *bengalensis* Rao, 1972
10. Middle segment endopodite P2-P4 with 1 inner seta *setosa* (Rao & Ganapati, 1969)
 — Middle segment endopodite P2-P4 with 2 inner setae *grandimandibularis* Wells, 1967

PART 2

INTRODUCTION

Two new species of harpacticoid copepod of the family Cyliindropsyllidae Sars, Lang, thought to be new to science, have been collected between mean and low tide levels on a high energy sandy beach in Algoa Bay. A species of *Leptastacus* T Scott is common around the mean tide level and a species of *Psammastacus* Nicholls is abundant around the spring low tide level (McLachlan & Furstenberg 1977).

SYSTEMATIC DESCRIPTIONS

Family *Cyliindropsyllidae* Sars, Lang

Leptastacus naylori sp. nov.

Material

Specimens were extracted from fine sand (median particle diameter 240 μm) on Sunday's River beach (25°53' E 33°43'S) and preserved in buffered formalin. Six adults were examined, two being dissected in lactic acid and mounted in polyvinyl lactophenol.

Holotype

1 ♀ (SAM-A15713) deposited in the South African Museum Cape Town, South Africa.

Allotype

1 adult ♂ (SAM-A15716) in the South African Museum.

Paratypes

1 ♀ (SAM-A15714) and 1 ♂ (SAM-A15715) in the South African Museum.

Description of adult female

Length 0,32–0,36 mm from base of rostrum to base of furcae. Body (Fig. 4A) vermiform, cylindrical with a short rostrum. Cephalothorax rectangular in dorsal view. Genital double-somite without obvious signs of subdivision. Anal operculum a rectangular plate with spinulose posterior margin.

Somitic ornamentation. Somites with a fine fully-incised subulate hyaline frill. Anal somite with ventral rows of spinules along posterior edge.

Furcal ramus (Figs 4B, 4I). Two times as long as broad and with an inner row of ventrally-directed spinules; two terminal setae, inner much longer than outer; one inner seta and two dorsal setae; distal end with a ventrally-directed spine.

Antennule (Fig. 4C). Seven-segmented, with an aesthetasc on segments four and seven. Segment two the longest and segments five and six the shortest.

Antenna (Fig. 4D). Coxa and allobasis devoid of ornamentation. Exopodite

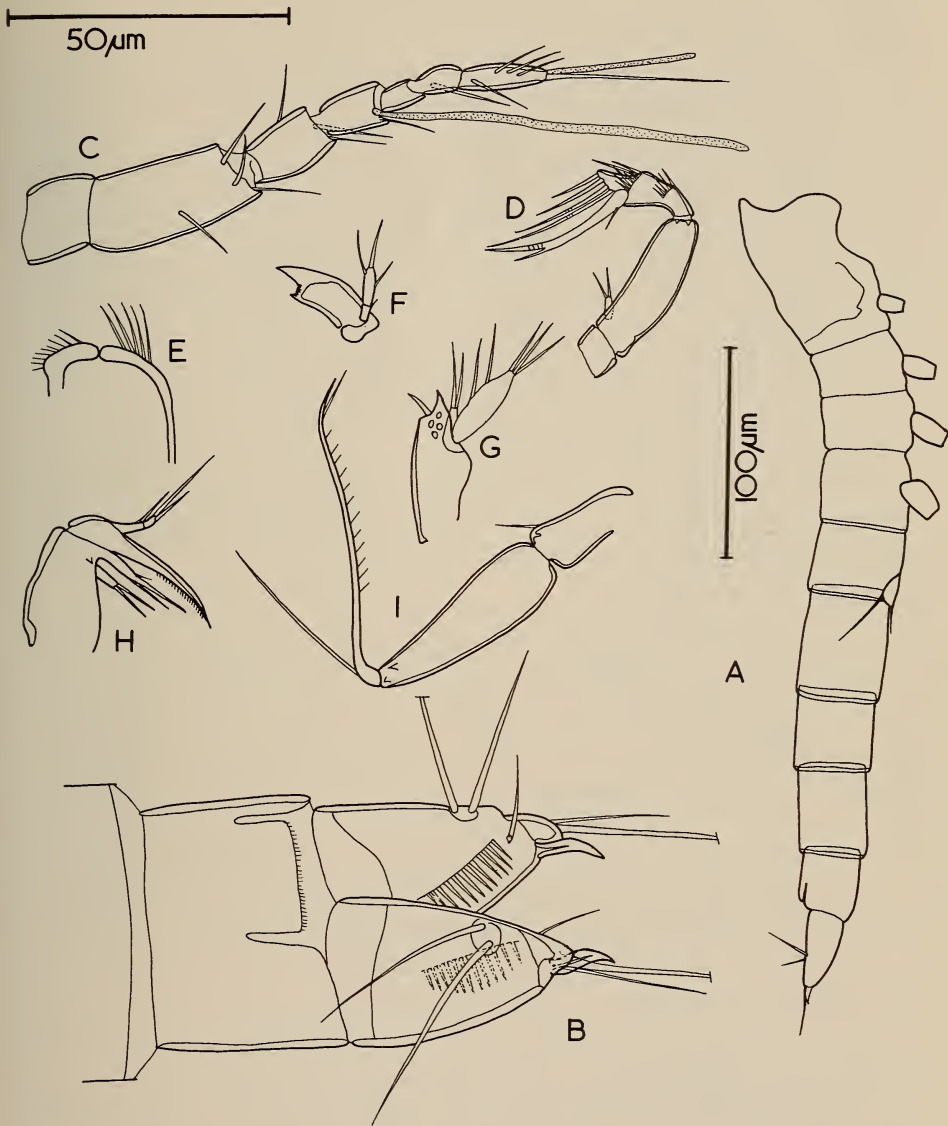


Fig. 4. *Leptastacus naylori* sp. nov. ♀

A. Habitus. B. Furcal rami. C. Antennule. D. Antenna. E. Labrum. F. Mandible. G. Maxillula. H. Maxilla. I. Maxillipede.

one-segmented, with two small apical setae. Endopodite furnished with two transverse rows of spinules on surface, two juxtaposed spines on anterior edge and distal edge with two plain setae and three geniculate setae, the most posterior sharing its base with a setule.

Mandible (Fig. 4F). Praecoxa with unidentate pars incisiva and a number of small teeth along cutting edge. Palp two-segmented, segment one with one spinule and segment two with one terminal and two lateral setae.

Maxillula (Fig. 4G). Arthrite of praecoxa with one claw and five spines. Coxa with two apical setae. Basis with three terminal and two lateral setae.

Maxilla (Fig. 4H). Syncoxa with two endites, proximal one with two setae, distal one with an unguiform spine and two setae. Basis with a large unguiform spine. Endopodite two-segmented; first segment with one seta, second segment with two apical setae.

Maxillipede (Fig. 4I). First endopodite segment elongate; second segment with a long, slender, pennate claw and a slender seta.

Leg 1 (Fig. 5A). Exopodite three-segmented, shorter than endopodite. Endopodite of two subequal segments.

Legs 2-4 (Fig. 5B-D). Exopodite three-segmented, spinulose along outer margin of first two segments. Endopodite of two subequal segments, shorter than exopodite and spinulose along outer margin.

The setal formula is:

	Exopodite			Endopodite	
	1	2	3	1	2
P1	0	0	0.2.1.	1	0.1.1.
P2	0	0	0.2.1.	1	0.1.0.
P3	0	0	1.2.1.	1	0.1.1.
P4	0	1	2.2.1.	0	0.1.0.

Leg (Fig. 5E). A triangular plate with one outer seta and spinule (or setule), two distal setae and some spinules along inner margin.

Description of adult male

Length 0,28-0,33 mm. Agrees with female apart from the following features. First two abdominal somites distinct.

Antennule (Fig. 5F). Haplocerate, eight-segmented. A very large aesthetasc on segment four and a small one on segment eight. Segment two the longest and segment five the shortest.

Leg 3. Second endopodite short and with one terminal seta.

Leg 5 (Fig. 5G). A plate with two marginal setae and a spinuliform projection.

Leg 6 (Fig. 5H). A plate with two setae.

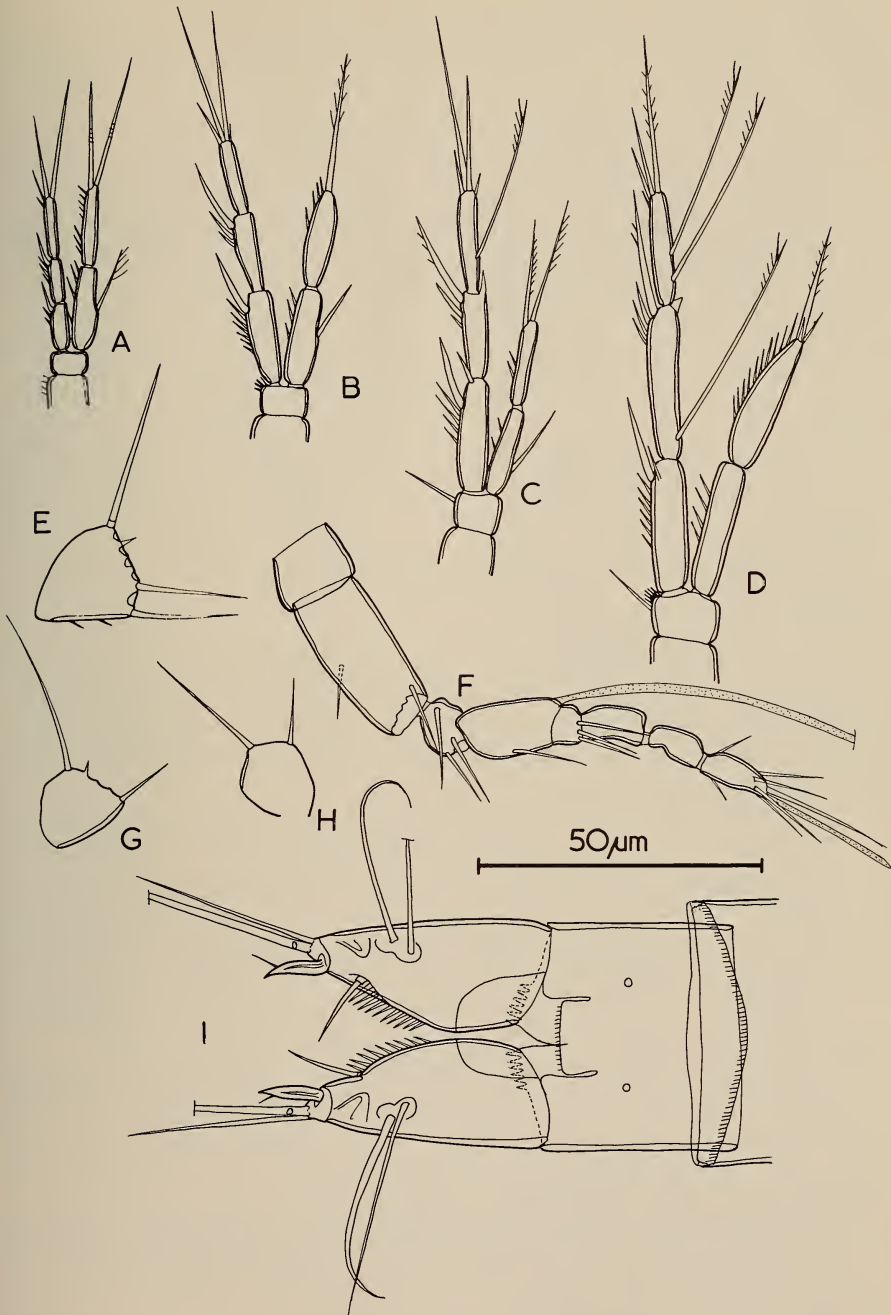


Fig. 5. *Leptastacus naylori* sp. nov.

A. ♀ P1. B. ♀ P2. C. ♀ P3. D. ♀ P4. E. ♀ P5. F. ♂ antennule. G. ♂ P5. H. ♂ P6.
I. ♀ furcal rami.

Etymology

This species is named in honour of Prof. Ernest Naylor of the Department of Marine Biology, University of Liverpool, Isle of Man.

Psammastacus erasmusi sp. nov.*Material*

Numerous specimens collected from medium sand (median particle diameter 260 μm) at low tide level on Sunday's River beach, preserved in 5 per cent formalin and mounted in polyvinyl lactophenol.

Holotype

1 ♀ (SAM-A15717) in the South African Museum.

Allotype

1 ♂ (SAM-A15718) in the South African Museum.

Paratypes

7 ♀♀ (SAM-A15719) in the South African Museum.

Description of adult female

Length 0,38–0,49 mm from base of rostrum to base of furcae. Body (Fig. 6A) vermiform, cylindrical with an elongate pointed rostrum (Fig. 6B). Cephalothorax rectangular in dorsal view. Genital double-somite without obvious signs of subdivision. Anal operculum a rectangular plate with spinulose posterior margin not easily visible.

Somitic ornamentation. Somites with a fine fully-incised subulate hyaline frill and circumscribed by a row of rectangular thickenings on the abdomen.

Furcal ramus (Fig. 7A). 1,5 times as long as broad and with an inner row of ventrally directed spinules; two terminal setae of unequal lengths; one inner articulated seta, one middorsal seta and one outer lateral seta; distal end with a strong, straight spine ventrally and a smaller, hooked spine dorsally.

Antennule (Fig. 6C). Seven-segmented with a large, annulated aesthetasc on segment four. Segment two the longest and segment five the shortest.

Antenna (Fig. 6D). Coxa and allobasis devoid of ornamentation. Exopodite one-segmented with two small apical setae. Endopodite furnished with two transverse rows of spinules on surface, two outer juxtaposed spines and two spines and three geniculate setae along distal edge; largest geniculate seta confluent at base with a fine seta.

Mandible (Fig. 6F). Praecoxa with unidentate pars incisiva and a number of small teeth along cutting edge. Palp two-segmented with one lateral and two terminal setae on second segment.

Maxillula (Fig. 6G). Praecoxal arthrite with one seta and five spines. Palp of one segment with two lateral and three terminal setae.

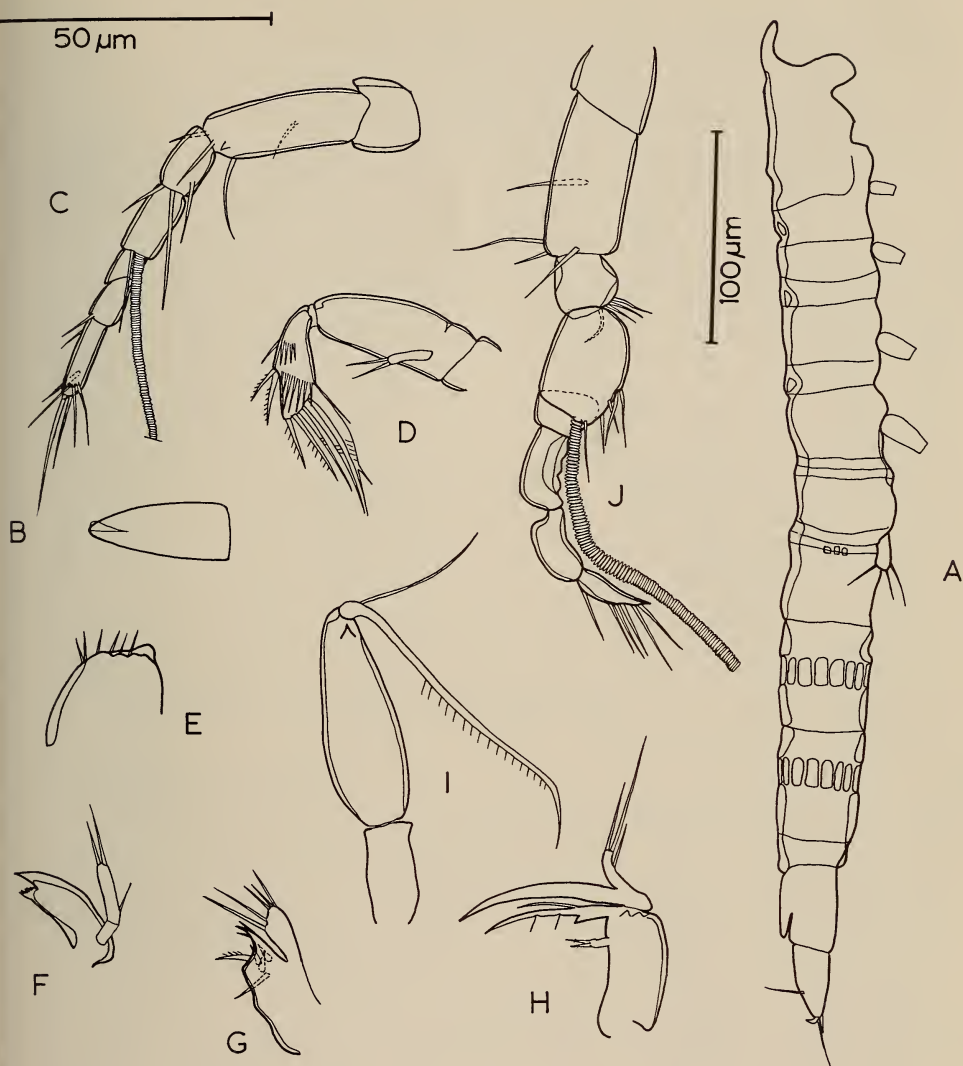


Fig. 6. *Psammastacus erasmusi* sp. nov.

A. ♀ habitus. B. ♀ rostrum. C. ♀ antennule. D. ♀ antenna. E. ♀ labrum. F. ♀ mandible.
G. ♀ maxillula. H. ♀ maxilla. I. ♀ maxillipede. J. ♂ antennule.

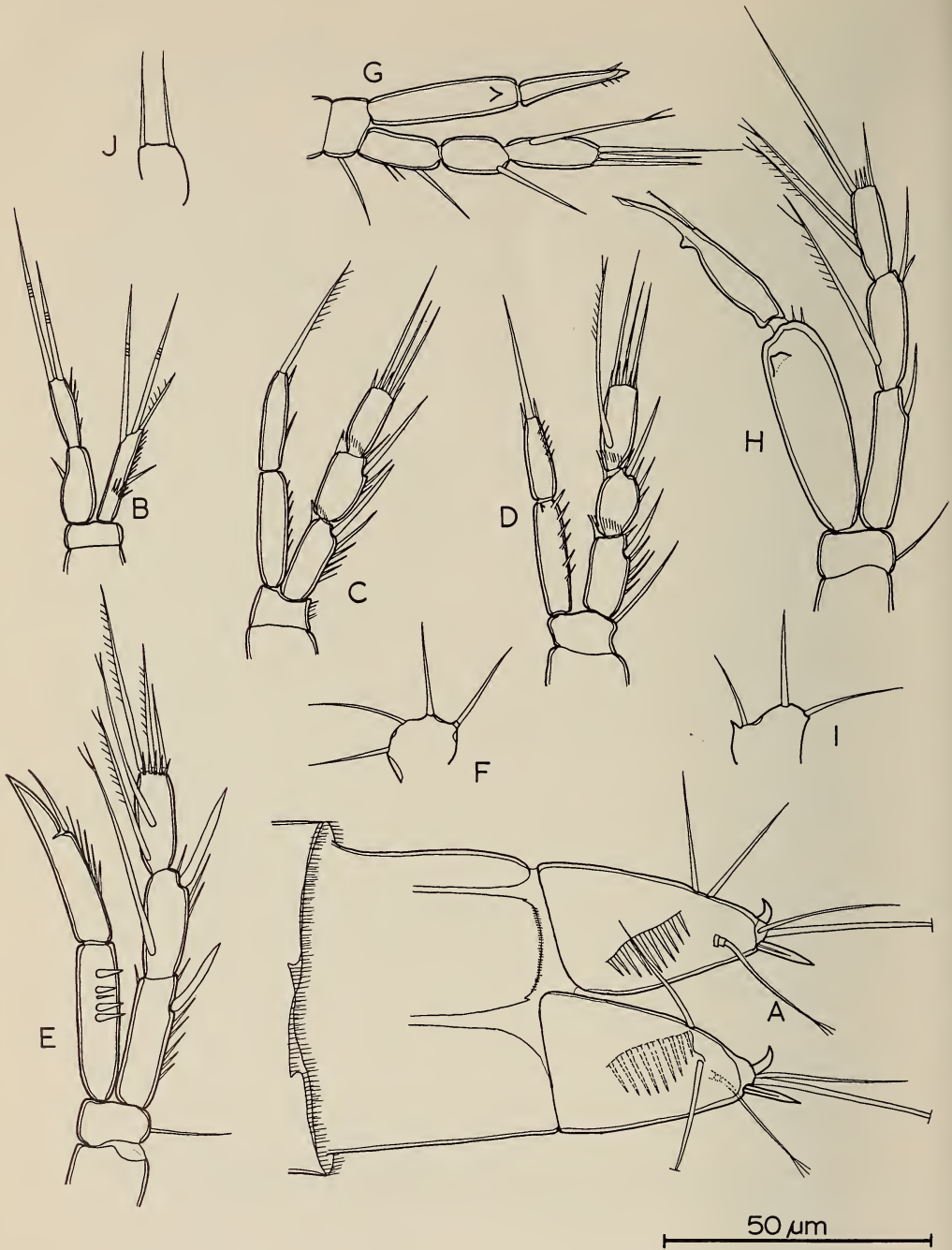


Fig. 7. *Psammastacus erasmusi* sp. nov.

A. ♀ furcal rami. B. ♀ P1. C. ♀ P2. D. ♀ P3. E. ♀ P4. F. ♀ P5. G. ♂ P3. H. ♂ P4.
I. ♂ P5. J. ♂ P6.

Maxilla (Fig. 6H). Syncoxa with two endites; smaller one with two small setae; larger one with a seta and an unguiform spine. Basis with a terminal unguiform spine. Endopodite with one lateral and two terminal fine setae.

Maxillipede (Fig. 6I). First endopodite segment elongate; second segment with a long, slender, pennate claw and a slender seta.

Leg 1 (Fig. 7B). Exopodite a single segment slightly longer than first endopodite segment; with three terminal setae and one outer spine midway along ramus. Endopodite of two subequal segments, the first with an inner median spine and the second with two terminal setae.

Legs 2-4 (Fig. 7C-E). Rami more or less spinulose along outer margins. Exopodite three segmented, with distal row of spinules; segments with a well-developed appendicular hyaline frill. Endopodite a little shorter, two-segmented. Fourth leg much the largest; inner distal spine of endopodite very stout and partly confluent at base.

The setal formula is:

	Exopodite			Endopodite	
	1	2	3	1	2
P1	-	-	0.2.2.	1	0.2.0.
P2	0	0	0.2.1.	0	0.1.0.
P3	0	0	1.2.1.	0	0.1.0.
P4	0	1	2.2.1.	0	0.2.0.

Leg 5 (Fig. 7F). A small plate with four setae.

Description of adult male

Length 0,37-0,47 mm. Agrees with female apart from the following features. First two abdominal somites distinct.

Antennule (Fig. 6J). Haplocerate, eight-segmented with an annulated aesthetasc on segment four. Segment six with three chitinous thickenings along anterior margin.

Leg 3 (Fig. 7G). As in female but without terminal seta on distal endopodite segment.

Leg 4 (Fig. 7H). As in female but inner distal spine of endopodite of different construction.

Leg 5 (Fig. 7I). A small plate with 3 setae and a short spinuliform projection at inner distal corner.

Leg 6 (Fig. 7J). A very small plate with two setae.

Etymology

This species is named in honour of Prof. Theunus Erasmus of the Zoology Department, University of Port Elizabeth.

DISCUSSION

Leptastacus naylori differs in the setation of the swimming legs from all the described species of *Leptastacus* T. Scott. In this respect it is closest to *L. macronyx* (T. Scott, 1892) and *L. laticaudatus* Nicholls, 1935, from which it differs in the presence of an extra inner seta on the distal segment of the endopodite of the third leg.

The following key to the females of the genus *Leptastacus* is based partly on the key of Lang (1965) and the setal formula table of Lindgren (1975). Here, because of inadequate descriptions, *L. nichollsi* Krishnaswamy, 1951, *L. acuticaudatus* Krishnaswamy, 1957, *L. euryhalinus* Krishnaswamy, 1957, and *L. macronyx pontica* Griga, 1962, have been omitted.

Apostolov (1973) gives drawings of a form from the Black Sea he ascribes to *L. laticaudatus* Nicholls, 1935 *intermedius* Kunz, 1938. However, as the fifth leg clearly differs from Kunz's (1938) original description of this subspecies, the Black Sea form is given in the key as *L. laticaudatus intermedius* sensu Apostolov.

KEY TO THE FEMALES OF *LEPTASTACUS* T. SCOTT

1. P2 endopodite with an inner seta on segment 1 2
- P2 endopodite without an inner seta on segment 1 10
2. P3 endopodite with an inner seta on segment 1 3
- P3 endopodite without an inner seta on segment 1 *minutus* Chappuis, 1954
3. P4 endopodite with 1 seta on terminal segment 4
- P4 endopodite with 2 setae on terminal segment 8
4. P3 endopodite with 1 seta on terminal segment 5
- P3 endopodite with 2 setae on terminal segment *naylori* sp. nov.
5. P5 foot-shaped at tip 6
- P5 not foot-shaped at tip 7
6. P5 with 2 inner setae *laticaudatus laticaudatus* Nicholls, 1935
- P5 with 3 inner setae *laticaudatus intermedius* Kunz, 1938
7. P5 produced distally into short projection with rounded tip; furca about 3 times as long as wide *laticaudatus intermedius* sensu Apostolov, 1973
- P5 produced distally into long pointed projection; furca at least 4 times as long as wide *macronyx* (T. Scott, 1892)
8. P5 produced distally into long pointed projection 9
- P5 not produced distally into long pointed projection *incurvatus* Lang, 1965
9. P3 endopodite with 1 seta on terminal segment *rostratus rostratus* Nicholls, 1939
- P3 endopodite with 2 setae on terminal segment *rostratus taurica* Marinov, 1973
10. Segment 2 exopodite P4 with no inner seta *aberrans* Chappuis, 1953
- Segment 2 exopodite P4 with 1 inner seta 11
11. Terminal segment endopodite P4 with 2 setae and spines in all *operculatus* Masry, 1970
- Terminal segment endopodite P4 with 1 seta 12
12. Terminal segment endopodite P3 with 2 setae and spines in all 14
- Terminal segment endopodite P3 with 1 seta 13
13. P5 with 5 setae *delamarei* Rouch, 1962
- P5 with 4 setae *waltairensis* Rao & Ganapati, 1969
14. P5 with no setae on inner margin *jenneri* Lindgren, 1975
- P5 with 1 seta on inner margin 15
- P5 with 2 setae on inner margin *wieseri* Chappuis, 1958
15. Principal furcal setae confluent at base *japonicus* Ito, 1968
- Principal furcal setae not confluent at base 16

16. Inner distal corner of furca produced into spiniform projection

- Inner distal corner of furca not produced *mozambicus* Wells, 1967
 — *constrictus* Lang, 1965

The setation of legs one to four of *Psammastacus erasmusi* agrees only with *P. spinicaudatus* Rao & Ganapati, 1969, and *P. remanei* Noodt, 1964. However, the sexual dimorphism of the third and fourth legs shows the species to be closest to *P. ghanai* Chappuis & Rouch, 1960. These two species differ in the setation of the fourth leg and in the structure of the fifth leg and furcal rami.

The modification of the endopodite of the fourth leg of the female in *P. erasmusi* is unique in the genus. Moreover, the annulated structure of the antennular aesthetascs has not been observed by the authors in any other species of harpacticoid copepod.

The following key to the genus is valid for both sexes.

KEY TO *PSAMMASTACUS* NICHOLLS

1. Third segment exopodite P4 with 2 inner setae 2
- Third segment exopodite P4 with 1 inner seta 6
2. Exopodite P1 with 3 setae and spines in all *perplexus* Wells & Clark, 1965
- Exopodite P1 with 4 setae and spines in all 3
3. Exopodite P1 with outer spine midway along ramus 4
- Exopodite P1 with no such spine midway along ramus *spinicaudus* Wells, 1967
4. Inner distal corner exopodite P4 prolonged into stout spine *erasmusi* sp. nov.
- Inner distal corner exopodite P4 with no such spine 5
5. Fifth legs partly fused along midline *spinicaudatus* Rao & Ganapati, 1969
- Fifth legs distinct along midline *ramanei* Noodt, 1964
6. Endopodite P4 with 1 apical seta 7
- Endopodite P4 with 2 apical setae 8
7. Furca broader than long *brevicaudata* Nicholls, 1935
- Furca longer than broad *confluens* Nicholls, 1935
8. P5 with 2 setae *acuticaudatus* Krishnaswamy, 1957
- P5 with 4 setae *ghanai* (Chappuis & Rouch, 1960)

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